INSTRUCTION MANUAL

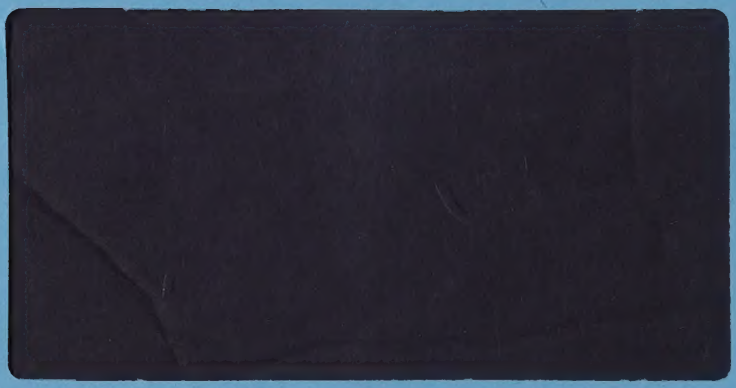
REGULATED POWER SUPPLIES

MODEL #LJS-11-20-OV-8529

MP MASTER
MA28715

LAMBDA

LAMBDA ELECTRONICS MELVILLE, L. I., N. Y.



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Addenda

Added Parts List

Schematic (Size L)

STD Instruction Manual: LJS-11-20-OV

MODEL #LJS-11-20-OV-8529

ADDENDA

MODEL #LJS-11-20-OV-8529

Lambda Model LJS-11-20-OV-8529 has all catalog specs. applicable to Model LJS-11-20-OV with the following deviations:

1. The DC output voltage is 17.0VDC $\pm$ 5% @ 4.0 amps @ 60°C.

2. The standard overvoltage protector remains the same.

3. The unit is treated to render it fungi-inert.

DEVIATION FROM AND/OR ADDED PARTS TO STANDARD ELECTRICAL PARTS LIST

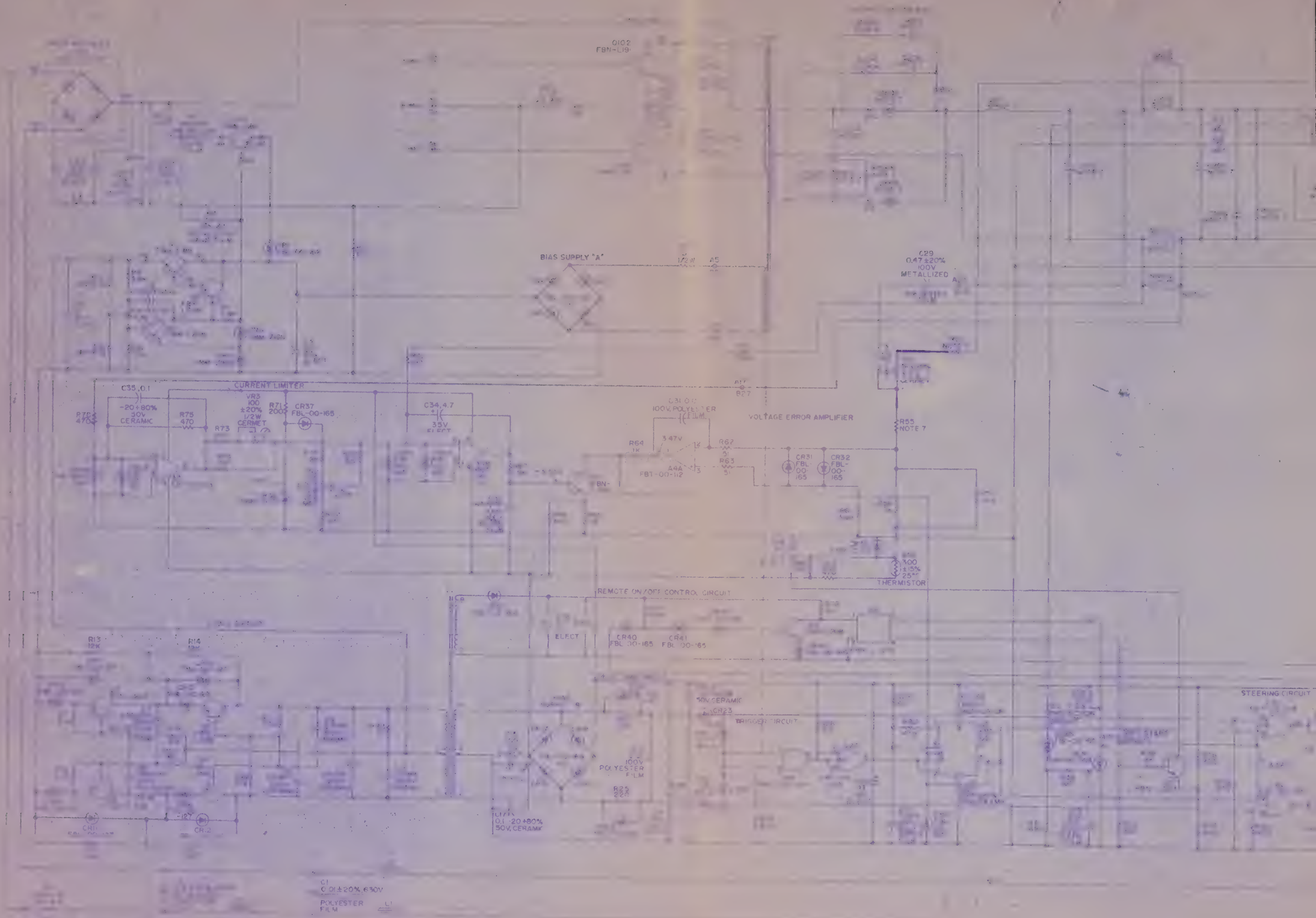
MODEL LJS-11-20-OV-8529

CIRCUIT DESIG.	DESCRIPTION	LAMBDA NO.
R53	Resistor 12K, 10%, ¼W	DCB-1231

TABLE I
SCHEMATIC DATA REFERENCES
MODELS LJS-11-5-OV THROUGH LJS-11-28-OV

Model	SCHEMATIC COMPONENTS													
	C104	C204 C205 C206	C207	C208 C209	CR102 CR103	R49	R53	R54	R55	R204	R204A R204B	R207	SH201 (1) SH202 (2)	MC101
	10+50% ELECT.	±10% CERAMIC	-10+50% ELECT.	-10+50% ELECT.	FBL-00*	CARBON FILM ±5%, ¼W	CARBON FILM ±5%, ¼W	CARBON FILM ±5%, ¼W	CARBON FILM ±5%, ¼W	WW ±5% 1W	WW ±5%, 1W	METAL OXIDE ±5%, 2W	SHUNT ESP-30-018	O.V. PROT.
LJS-11-5-OV	470 mf 10 vdc	4700 pf 100 vdc POLY-FILM	6800 mf 10 vdc	2200 mf 10 vdc	169	200	3.3K	1.6K	910	51	NOT USED	51	(1) and (2)	*L-35-OV-5
LJS-11-6-OV	470 mf 10 vdc	4700 pf 100 vdc POLY-FILM	6800 mf 10 vdc	2200 mf 10 vdc	169	200	4.3K	5.1K	1.1K	51	NOT USED	51	(1) and (2)	*L-35-OV-6
LJS-11-12-OV	220 mf 25 vdc	4700 pf 500 vdc	330 mf 25 vdc	470 mf 25 vdc	131	100	9.1K	7.5K	1.3K	51	NOT USED	300	(1) ONLY	*L-35-OV-12
LJS-11-15-OV	220 mf 25 vdc	4700 pf 500 vdc	3300 mf 25 vdc	470 mf 25 vdc	131	100	12K	12K	1.3K	51	NOT USED	360	NONE USED	*L20-OV-15
LJS-11-20-OV -8529	100 mf 35 vdc	4700 pf 500 vdc	2200 mf 35 vdc	470 mf 35 vdc	132	100	12 K	NOT USED	1.8K	NOT USED	100	620	NONE USED	*L20-OV-20
LJS-11-24-OV	100 mf 35 vdc	4700 pf 500 vdc	2200 mf 35 vdc	470 mf 35 vdc	132	100	20K	43K	1.8K	NOT USED	100	910	NONE USED	*L20-OV-24
LJS-11-28-OV	100 mf 63 vdc	4700 pf 500 vdc	1000 mf 63 vdc	330 mf 50 vdc	132	100	24K	91K	2.4K	NOT USED	100	1200	NONE USED	*L20-OV-28

*Lambda part number


BIAS SUPPLY "A"
C29
0.47 ±20%
100V
METALLIZED
CURRENT LIMITER
C35, 0.1
-20+80%
50V
CERAMIC
R75
470
R73
VR3
100
±20%
1/2W
CERMET
R71
200Ω
CR37
FBL-00-165
C34, 4.7
35V
ELECT
R70
470
VOLTAGE ERROR AMPLIFIER
C31 0.1
100V POLYESTER
FILM
R64
1K
3.47V
R62
3
R63
3
CR31
FBL-
00-
165
CR32
FBL-
00-
165
FBT-00-112
R55
NOTE 7
300
±15%
25°C
THERMISTOR
REMOTE ON/OFF CONTROL CIRCUIT
ELECT
CR40
FBL-00-165
CR41
FBL-00-165
R13
12K
R14
100
50V CERAMIC
CR23
TRIGGER CIRCUIT
100V
POLYESTER
FILM
R25
22Ω
0.1 -20+80%
50V, CERAMIC
STEERING CIRCUIT
C1
C 0.1 ±20% 630V
POLYESTER
FILM
L1

SYM	DESCRIPTION	DATE	APPD
A	CR9	4/17/81	G.W.

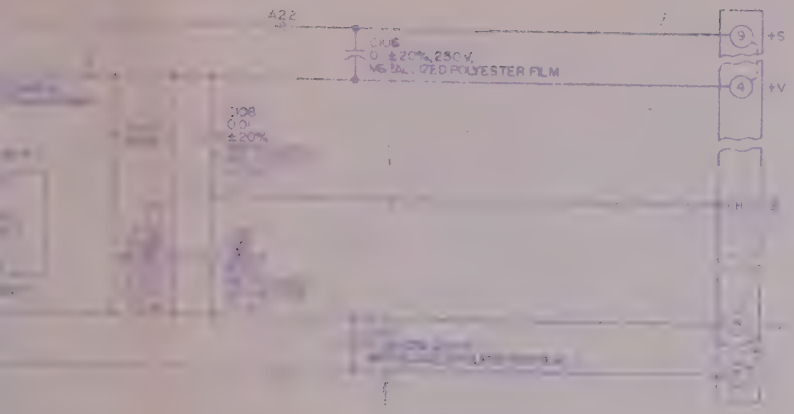
NOTES

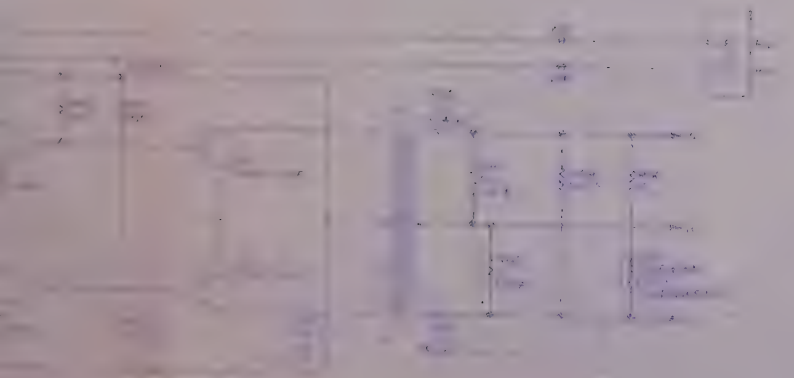
1. RESISTORS ARE ¼W CARBON FILM WITH VALUES IN OHMS UNLESS OTHERWISE NOTED
2. CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED
3. RESISTOR TOLERANCES: CARBON FILM ±5%, WIREWOUND ±5% UNLESS OTHERWISE NOTED
4. CAPACITOR TOLERANCES: ELECTROLYTIC −10+50%, CERAMIC ±10%, POLYESTER FILM ±10% METALLIZED POLYESTER FILM ±10% UNLESS OTHERWISE NOTED
5. SYMBOLS
   - ▭ INDICATES ACTUAL UNIT MARKING
   - ↻ INDICATES CLOCKWISE ROTATION OF SHAFT
   - ✱ SEE INSTRUCTION MANUAL
   - ⊘ INDICATES ADJUSTMENT OR CALIBRATION CONTROL
   - ⊸ INDICATES TERMINAL ON PRINTED WIRING BOARD OR TERMINAL BOARD
     TERMINALS WITH "A" DESIGNATIONS ARE ON THE "A" BOARD.
     TERMINALS WITH "B" DESIGNATIONS ARE ON THE "B" BOARD.
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. SEE TABLE I FOR COMPONENT VALUES
8. SEE TABLE I FOR VOLTAGE VALUES.
9. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS
   INPUT 117 VAC, 47 - 440 Hz
   OUTPUT NOMINAL VOLTAGE, FULL LOAD, +S AND +V SHORTED, −S AND −V SHORTED.
   INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER. AC MEASUREMENTS ARE PEAK VALUES MEASURED WITH OSCILLOSCOPE. VOLTAGES ARE TAKEN BETWEEN INDICATED POINTS AND −S (TERM 7) UNLESS OTHERWISE NOTED
10. THESE COMPONENTS ARE SELECTED IN TEST AND CAN VARY FROM UNIT TO UNIT, OR IN SOME CASES MAY NOT BE USED AT ALL. REFER TO TABLE II FOR SPECIFIC COMPONENT VALUES APPLICABLE TO THE COMPONENTS OF THE UNIT IN USE.

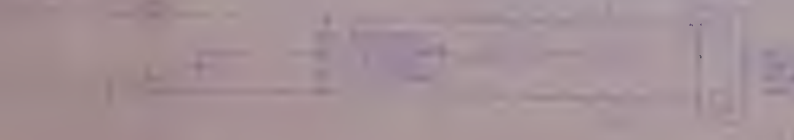
TABLE II

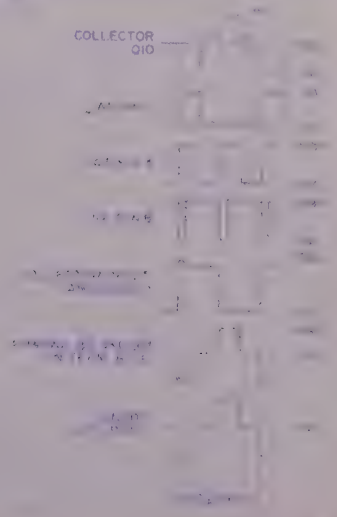
✱ RESISTORS ARE CARBON FILM 1/4WATT ±5% UNLESS OTHERWISE NOTED

11. THE FOLLOWING WAVEFORMS, TAKEN UNDER FULL LOAD CONDITIONS, CAN BE OBSERVED BETWEEN INDICATED POINTS AND −SENSE UNLESS OTHERWISE NOTED, AND ARE TYPICAL VALUES









MODEL
LJS-11-20 SN 8529

SHEET 1 OF 2

INSTRUCTION MANUAL

REGULATED POWER SUPPLIES

LJS-11 SERIES

LAMBDA

LAMBDA ELECTRONICS MELVILLE, L. I., N. Y.

INSTRUCTION MANUAL

FOR

REGULATED POWER SUPPLIES

LJS-11 SERIES

This manual provides instructions intended for the operation of Lambda power supplies, and is not to be reproduced without the written consent of Lambda Electronics. All information contained herein applies to all LJS-11 models unless otherwise specified.

LAMBDA ELECTRONICS MELVILLE, L.I., N.Y.

MAIN PLANT TELEPHONE: 516 MYrtle 4-4200

IM-LJS-11

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SPECIFICATIONS AND FEATURES

DC OUTPUT — Voltage regulated for line and load. See table I for voltage and current ratings.

TABLE I
VOLTAGE AND CURRENT RANGES

MODELS	VOLTAGE RANGE	MAXIMUM CURRENT (AMPS) AT AMBIENT TEMPERATURE		
		50°C	60°C	71°C
LJS-11-5-OV	5 ± 5%	20.0	16.0	11.0
LJS-11-6-OV	6 ± 5%	16.7	13.3	9.2
LJS-11-12-OV	12 ± 5%	8.3	6.6	4.5
LJS-11-15-OV	15 ± 5%	6.7	5.3	3.7
LJS-11-20-OV	20 ± 5%	5.0	4.0	2.7
LJS-11-24-OV	24 ± 5%	4.2	3.3	2.3
LJS-11-28-OV	28 ± 5%	3.6	2.9	2.0

Current range must be chosen to suit the appropriate maximum ambient temperature. Current ratings apply for entire voltage range.

REGULATED VOLTAGE OUTPUT

Regulation ..... 0.4% line or load with input variations from 105-132 or 132-105 volts AC and load variations from no load to full load.

Ripple and Noise ..... 10mV RMS, 50mV peak-to-peak for LJS-11-5-OV,-6-OV models; 15mV RMS, 100mV peak-to-peak for LJS-11-12-OV, -15-OV, -20-OV, -24-OV, and -28-OV with either positive or negative terminal grounded.

Temperature Coefficient ..... Change in output voltage 0.03%/°C max.

Remote Programming

External Resistor ..... Nominal 1000 ohms/volt output.

Programming Voltage ..... One-to-one voltage change.

Remote Sensing ..... Provision is made for remote sensing to eliminate effect of power output lead resistance on DC regulation.

REMOTE ON-OFF CONTROL — The DC output of all LJS-11 power supplies can be turned on and off remotely by means of digital command.

Logic level ..... 0 to +5 volts (logic "0" for ON, logic "1" for OFF)
Loading ..... 1.6 ma sinking required (TTL compatible)

STORAGE TIME — 16 ms min. at full rated current, maximum rated output voltage, and 105 VAC input.

OVERSHOOT — No overshoot under conditions of power turn-on, turn-off, or power failure.

INPUT

AC Input ..... 105-132 VAC at 47-440 Hz. Input power: 130 Watts*. For operation at frequencies above 440 Hz, consult factory.

*With output loaded to full current rating.

DC Input ..... 145 VDC ±10%. Input power: 130 Watts†.

†With output loaded to full current rating.

INPUT FUSE — Fuse F1 protects the input wiring to the power supply. Overload of power supply does not cause fuse failure.

OVERLOAD PROTECTION

Electrical

External ..... Automatic electronic current limiting circuit, limits output current to a preset safe value. Automatic current limiting protects the load and power supply when external overloads and direct shorts occur.

Internal ..... Fuse F1 provides protection against internal circuit failure.

OVERVOLTAGE PROTECTION — All LJS-11models include fixed built-in overvoltage protection circuits which prevent damage to the load caused by excessive power supply output voltage. See table below for overvoltage protector firing ranges.

MODEL	OVERVOLTAGE PROTECTOR TRIP-POINT RANGE (VOLTS)
LJS-11-5-OV	6.3 — 6.9
LJS-11-6-OV	7.1 — 7.7
LJS-11-12-OV	13.3 — 14.3
LJS-11-15-OV	16.5 — 17.5
LJS-11-20-OV	22.1 — 23.5
LJS-11-24-OV	26.5 — 28.1
LJS-11-28-OV	30.9 — 32.9

INPUT AND OUTPUT CONNECTIONS — Terminal blocks on front of chassis. Reed-Prince No. 2 screwdriver is required for terminal screws.

OPERATING AMBIENT TEMPERATURE RANGE AND DUTY CYCLE — Continuous duty from 0°C to 71°C ambient with corresponding load current ratings for all modes of operation.

STORAGE TEMPERATURE (non operating) — -55°C to +85°C

VDC ADJ. Control — Voltage adjust control permits adjustment of DC output over entire operating range.

GUARANTEE — 5 year guarantee from date of shipment . . . materials and labor.

PHYSICAL DATA

Size	4-5/16" x 4-3/4" x 7-15/16"
Weight	5.5 lbs. net
Finish	Gray, FED. STD. 595 No. 26081

MOUNTING — One surface with tapped mounting holes can be utilized for mounting this unit. All LJS-11 power supplies must be mounted with Top facing up and in horizontal plane. Refer to figure 10 for mounting details.

THEORY OF OPERATION

GENERAL

The Lambda power supply consists of an input circuit; internal power supply and starter circuit; clock circuit; dead-time circuit; trigger circuit; pulse width modulator; soft-start circuit; steering circuit, voltage error amplifier; current limiter circuit; remote ON/OFF control circuit; inverter; output rectifier and over-voltage protection circuit.

The circuit arrangement is shown in block diagram form in figure 8. The circuitry is discussed with reference to the block diagram and the schematic diagram.

FUNCTIONAL DESCRIPTION

Input Circuit

Single phase AC input power is applied to the input rectifier CR101, C201, C202 via EMI suppression network L1, L2, C1, L3, C2, R1 and R2. Fuse F1 protects against internal power supply circuit failure.

Internal Power Supply Circuit

The starter circuit CR1, R4, C3 and Q101 applies input power to the internal power supply consisting of Q1, Q2, Q3, CR6, CR7, C5, C6, R3, R7, R9 and R10, whenever input power is initially applied or when a no-load condition exists at the output after initial turn-on. Feedback bias supply "A" CR2—CR5 and R5 applies power to the internal power supply from the 20KHz inverter. The internal power supply, a linear power supply, provides 28.8 VDC at the emitter of Q1.

Clock Circuit

The clock circuit consisting of Q4—Q7, CR9—CR16, R13—R23, C7—C12, and T2 functions as the master oscillator and the source of DC power to the control circuitry. The waveform at the collector of Q6 and Q7 is square, with a 50% duty cycle in periods of 50 microseconds.

Control Circuitry

The pulse width modulator consisting of A3, R29, R30, CR27, C20—C22 is supplied triggered pulses by trigger circuit CR21—CR26, R24—R26, A1 and A2. Bias supply "B" CR17—CR20 and C14 provides 5VDC to A1, A2 and A3 and to driver circuit transistors Q9 and Q10. The steering circuit, which consists of A1 and A2 converts single-phase pulses from the pulse width modulator to two phase pulses which are fed to driver circuit Q9, Q10, R79, C26 and T3, which, in turn, applies the pulses to switching transistors Q102 and Q103 in the inverter. Dead-time circuit R24, R25 and C13 creates non-conducting dead-time for inverter switching transistors Q102 and Q103. Soft start circuit transistor Q8 prevents voltage overshoot when the unit is remotely turned on via a remote turn-on signal applied to terminals RV1 and RV2.

Voltage Error Amplifier

The voltage error amplifier consists of A4, C31, R62, R63, CR31, CR32 and R61, reference voltage diode CR33 and C28, R60, R59, R58 and output voltage sensing network R53, VR4, R54, R55, R56 and C29. The programming current, 1 mA used in the sensing network, is determined by R56.

Current Limiter Circuitry

The current limit circuitry consists of: buffer amplifier A5, CR39, CR38, R76, R75, C35; current sampling circuit SH201 and SH202, R68; reference voltage network R71—R72, VR3, CR37, CR36 and amplifier A4, CR34, CR35, C34.

The buffer amplifier acts to change the polarity of the line-drop voltage between the load and the output side of SH201 and SH202, with unity gain. R68 serves to sum the voltage drop across SH201 and SH202 and the line and between the load and the input side of SH201 and SH202 to A4. The reference voltage is set by adjustment of VR2 through summing resistor R69 and serves to limit overcurrent conditions in the output of the supply.

The amplifier compares the reference voltage with the current sampling voltages and is combined with the voltage error amplifier signal through the action of Q11.

Remote ON/OFF Control Circuit

The remote ON/OFF control circuit A6, CR41, C36, CR40—CR43, Q12, R77 and R78 controls unit operation by means of an external ON/OFF control signal, which is generally compatible with TTL voltage levels, supplied to terminals RV1 and RV2. Terminals RV1 and RV2 are isolated from the input line and the output of the unit by means of photo isolator A6.

When RV1 and RV2 are open circuited or are supplied high TTL voltage, a transistor contained in A6 turns off and one of three inputs to A2 goes to a low voltage level of TTL, which causes the inverter to shut down.

Inverter

The inverter, a push-pull circuit consists of two switching power transistors Q102 and Q103. When Q102 turns on, switching current flows through the primary of T1 in one direction and in the next half period of the cycle Q103 turns on and Q102 turns off and switching current then flows through the primary of T1 in the opposite direction.

Output Circuit

Positive and negative pulses supplied by the secondary of T1 are rectified by full-wave rectifiers CR102 and CR103; are filtered by a filter network and EMI suppression network: L201, C207, L202 and L203, C207 and C209 and then supplied to the output.

Overvoltage Protection Circuit

The overvoltage protection circuit consists of two sections, one part, a current transformer circuit consists of the current transformer and a hybrid OV crowbar module MC101. When the output voltage reaches the trip-point of hybrid overvoltage module MC101, the module fires, crowbarring the output of the supply to a safe level. The second part of the circuit consisting of SCR1, CR28, R31—R33 and C23, uses the output voltage signal generated by the current transformer to turn on SCR1, which, in turn, crowbars logic circuitry of A2 that causes the inverter to shut down.

OPERATING INSTRUCTIONS

BASIC MODE OF OPERATION

This power supply operates as a constant voltage source provided the load current does not exceed the rated value at 50°C. For continuous operation, load current must not exceed the rating for each ambient temperature. When rated load current is exceeded, voltage decreases towards zero and the current at short circuit is held to a safe value.

CONNECTIONS FOR OPERATION

NOTE: Make all connections to the unit before applying input power.

Ground Connections. The Lambda power supply can be operated either with negative or positive output terminal grounded. Both positive and negative ground connections are shown in the diagrams for all suggested output connections illustrated in this manual.

Connection Terminals. Make all connections to the supply at the terminal block on the front of the supply. Use a Reed-Prince no. 2 screwdriver on terminal screws. Apply input power to terminals 1 and 2; always connect the ungrounded AC or DC lead to terminal 1.

The supply positive terminal is brought out to terminal 4. The supply negative terminal is brought out to terminal 3. Recommended wiring of the power supply to the load and selection of wiring is shown in figures 1 through 9. Selection of proper wiring is made on the basis of load requirements. Make all performance checks and measurements of current or voltage at the front output terminals. Connect measuring devices directly to terminals or use the shortest leads possible.

Remote on-off control is brought out to RV1 (terminal 5) and RV2 (terminal 6). RV2 should always be connected to ground (terminal 8). The digital on-off command is applied to RV1. Logic "0" for ON and logic "1" for OFF. If remote on-off control is not required, both terminals RV1 and RV2 should be connected to ground. The output will then always be on as long as input power is present. Proper remote on-off control connection is shown for all suggested output connections illustrated in this manual.

SUPPLY LOAD CONNECTIONS

Connections for Operation as a Constant Voltage Source

The output impedance and regulation of the power supply at the load may change when using the supply as a constant voltage source and connecting leads of practical length are used. To minimize the effect of the output leads on these characteristics, remote sensing is used. Recommended types of supply load connections with local or remote sensing are described in the following paragraphs.

Local Sensing Connection, Figure 3. Local sensing is the connection suitable for applications with relatively constant load or for applications with short power output leads.

Remote Sensing Connection, Figure 4. Remote sensing provides complete compensation for the DC voltage drops in the connecting cables. Sensing leads should be a twisted pair to minimize AC pick-up. A 2.5 mf elect., capacitor may be required between output terminals and sense terminals to reduce noise pick-up.

Programmed Voltage Connections, Using External Resistor, Figure 5. Discrete voltage steps can be programmed with a resistance voltage divider valued at a nominal 1000 ohms/volt change and a shorting-type switch as shown in figure 5. When continuous voltage variations are required, use a variable resistor with the same 1000 ohms/volt ratio in place of the resistive voltage divider and shorting-type switch. Use a low temperature coefficient resistor to assure most stable operation.

Before programming, adjust programming resistor for zero resistance and set voltage adjust control to the minimum rated output voltage. Output voltage of programmed supply will nominally be minimum output voltage plus 1 volt per 1000 ohms.

As shown in figure 5, voltages can be programmed utilizing either local or remote sensing connections, as desired.

Programmed Voltage Connections Using Programming Voltage, Figure 6. The power supply voltage output can be programmed with an externally connected programming power supply. The output voltage change of the programmed supply will maintain a one-to-one ratio with the voltage of the programming supply. If the output voltage control of the programmed supply is set to minimum output voltage, output voltage of the programmed supply will be minimum output voltage plus voltage of programming supply.

The programming supply must have a reverse current capability of 1.1ma. minimum.

Alternatively, when supplies with less than 1.1ma. reverse current capability are used, a resistor capable of drawing 1.1ma. at the minimum programming voltage must be connected across the output terminals of the programming supply. This programming supply must be rated to handle all excess resistor current at the maximum programming voltage.

Connections For Series Operation, Figure 7.

The voltage capability of LJS-11 power supplies can be extended by series operation. Figure 7 shows the connections for either local or remote sensing in a series connection where the voltage control of each unit functions independently to control the output.

A diode, having a current carrying capability equal to or greater than the maximum current rating of the supply, must be used and connected as shown in figure 7. The diode blocking voltage should be at least twice the maximum rated output voltage of the supply. See table I, of SPECIFICATIONS AND FEATURES, for power supply current and voltage ratings.

OPERATION AFTER PROTECTIVE DEVICE SHUTDOWN

Fuse Shutdown. Fuse will blow when the maximum rated current value for the fuse is exceeded. Fatigue failure of fuses can occur when mechanical vibrations from the installation combine with thermally induced stresses to weaken the fuse metal. Many fuse failures are caused by a temporary condition and replacing the blown fuse will make the fuse protected circuit operative.

Overvoltage Shutdown. When the power supply output voltage increases above the overvoltage limit, the overvoltage protection circuit will short circuit output of the supply and shut down inverter operation. After eliminating the cause(s) for overvoltage, resume operation of the supply by momentarily interrupting the AC input circuit.

GENERAL

This section describes trouble analysis routine, calibration and test procedures that are useful for servicing the Lambda power supply. A trouble chart is provided as an aid for the troubleshooter. Refer to the section on SPECIFICATIONS AND FEATURES for the minimum performance standards.

TROUBLE ANALYSIS

Whenever trouble occurs, systematically check all fuses, primary power lines, external circuit elements, and external wiring for malfunction before troubleshooting the equipment. Failures and malfunctions often can be traced to simple causes such as improper jumpers and supply-load connections or fuse failure due to metal fatigue.

Use the electrical schematic diagram and block diagram, figure 8, as an aid to locating trouble causes. The schematic diagram contains various circuit voltages that are averages for normal no load operation. Measure these voltages using the conditions for measurement specified on the schematic diagram. Use measuring probes carefully to avoid causing short circuits and damaging circuit components.

CHECKING TRANSISTORS AND CAPACITORS

Check transistors with an in-circuit transistor checker. If no checker is available, transistors can be checked with an ohmmeter that has a highly limited current capability. Observe proper polarity for PNP or NPN to avoid error in measurement. The forward transistor resistance is low but never ZERO; backward resistance is always higher than the forward resistance.

Do not assume trouble is eliminated when only one part is replaced. This is especially true when one transistor fails, causing other transistors to fail. Replacing only one transistor and turning power on, before checking for additional faulty components could damage the replaced component.

When soldering semi-conductor devices, hold the lead being soldered with a pair of pliers or a commercial heat sink device placed between the component and the solder joint.

NOTE: The leakage resistance obtained from a simple resistance check of a capacitor is not always an indication of a faulty capacitor. In all cases the capacitors are shunted with resistances, some of which have low values. Only a dead short is a true indication of a shorted capacitor.

PRINTED CIRCUIT BOARD MAINTENANCE TECHNIQUES

1. If foil is intact, but not covered with solder, it is a good contact. Do not attempt to cover with solder.
2. Voltage measurements can be made from either side of the board. Use a needle-point probe to penetrate to the wiring whenever a protective coating is used on the wiring. A brass probe can be soldered to an alligator clip adapted to measuring instrument.
3. Always use a heat sink when soldering transistors; a transistor pad with mounting feet is an effective heat sink.
4. Broken or damaged printed wiring is usually the result of an imperfection, strain or careless soldering. To repair small breaks, tin a short piece of hook-up wire to bridge the break, and holding the wire in place, flow solder along the length of wire so that it becomes part of the circuitry.
5. When unsoldering components from the board never pry or force loose the part; unsolder the component by using the wicking process described below:
   a) Select a 3/16 inch tinned copper braid for use as a wick; if braid is not available, select AWG No. 14 or No. 16 stranded wire with 1/2 inch insulation removed.
   b) Dip the wick in liquid rosin flux.

c) Place the wick onto the soldered connection and apply soldering iron onto the wick.

d) When sufficient amount of solder flows onto the wick, freeing the component, simultaneously remove iron and wick.

TROUBLE CHART

The trouble chart is intended as a guide for locating trouble causes and is used along with the schematic diagram.

The operating conditions assumed for the trouble chart are as follows:

a) AC power of proper voltage and frequency is present at input terminals.

b) Either positive or negative terminal is connected to chassis ground.

c) The power supply is connected for constant voltage with local sensing. See schematic; dotted lines indicate jumpers connected for local sensing operation.

SAFETY NOTICE

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT. OBSERVE THE USUAL SAFETY PRECAUTIONS WHEN OPERATING OR SERVICING THE EQUIPMENT TO AVOID SHOCK OR INJURY.

TROUBLE SHOOTING CHART

Symptom	Possible Cause	Remedy
1. Zero volts DC output, no-waveform between collector of Q7 and negative of C201.	Open F1. Defective Q102 and Q103.	Check and replace as necessary.
2. Same as 1, waveform between collector of Q7 and negative of C202 is correct, voltage across C14 is zero or too low.	Defective CR17 thru CR20. Defective Q9, Q10.	Check and replace as necessary.
3. Same as 2, voltage across C14 is correct, no-waveform between A2-6 and -S (GND).	Defective A1, A2. Defective CR21 thru CR26.	Check and replace as necessary.
4. Same as 3, waveform between A2-6 and -S (GND) is correct, no-waveform between A3-3 and -S (GND).	Defective A3, A4, A5.	Replace as required.
5. Same as 4, waveform between A3-3 and -S (GND) is correct, voltage across A2-1 to -S (GND) is too low.	Disconnected wire at terminals RV1 and RV2.	Reconnect as required.
	Defective A6.	Check voltage across C36, if voltage across C36 is correct, replace A6 as required.
	Defective SCR1.	Check and replace as necessary.
	Defective OV module MC101.	Replace as required.

TROUBLE SHOOTING CHART

Symptom	Possible Cause	Remedy
6. Same as 5, voltage across A2-1 to -S is correct, no-waveform between A1-3 to -S.	Defective A1, A2. Defective Q9, Q10.	Check and replace as necessary.
7. Same as 6, waveform between A1-3 to -S is correct, no-waveform between collector of Q9 and -S.	Defective Q9, Q10.	Check and replace as necessary.
8. Same as 7, waveform between collector of Q9 and -S is correct, no-waveform between anode of CR102 and -S.	Defective Q102 and Q103.	Check and replace as necessary.
9. Output DC voltage is too low.	Defective CR33.	Check and replace as necessary.
10. R4 is very hot under full load.	Defective CR2 thru CR5.	Check and replace as necessary.
11. Defective current limiting.	Defective CR36. Defective A4, A5.	Check and replace as necessary.
12. DC output unregulated.	Defective A4.	Replace as required.

PERFORMANCE CHECKS

Check the ripple and regulation of the power supply using the test connection diagram shown in figure 9. Use suggested test equipment or equivalent to obtain accurate results. Refer to SPECIFICATIONS AND FEATURES for minimum performance standards.

Set the differential meter, DC DVM (John Fluke Model 891A or equivalent) to the selected power supply operating voltage. Check the power supply load regulation accuracy while switching from the no load to load condition. Long load leads should be a twisted pair to minimize AC pick-up.

Use a Variac to vary the line voltage from 105-132 or 132-105 volts AC and check the power supply line regulation accuracy on the DVM differential meter.

Use a TVM, John Fluke Model 931B or equivalent, to measure rms ripple voltage of the power supply DC output. Use oscilloscope to measure peak-to-peak ripple voltage of the power supply DC output.

ADJUSTMENT OF CALIBRATION CONTROLS VR2, VR3.

Whenever voltage and current indications do not reflect maximum ratings, adjust VR2 and VR3 as follows. The adjustment procedure requires that the power supply is removed from associated equipment, is at an ambient temperature of 25-30°C, and is stabilized and not operating.

1. Remove AC input power to the supply.
2. Break seal on wiper of VR3 from resistor housing and turn to full CCW position.
3. Operate power supply for constant voltage with local sensing connected as shown in figure 3, with no external load, and with AC input of 132 VAC, 60 Hz.
4. Turn voltage adjust control until minimum rated output voltage is obtained.
5. Apply load so that output current is 105-110% of 50°C rating for the unit.
6. Using a differential meter, DC DVM (John Fluke Model 891A or equivalent), observe output voltage while adjusting VR3 in CW direction. Adjust VR3 until output voltage drops.
7. Remove AC power input to the supply.
8. Break seal on wiper of VR2 from resistor housing.
9. Operate power supply for constant voltage with remote sensing connected as shown in figure 4, with AC input 132 VAC, 60 Hz.
10. Adjust VR2 to the same operating point as described above.
11. Repeat steps 3 through 10 until no further adjustment is required.
12. After adjustment is completed, remove AC input power to the supply and reseal wipers of VR2 and VR3.

SERVICE

When additional instructions are required or repair service is desired, contact the nearest Lambda office where trained personnel and complete facilities are ready to assist you.

Please include the power supply model and serial number together with complete details of the problem. On receipt of this information, Lambda will supply service data or advise shipping for factory repair service.

All repairs not covered by the warranty will be billed at cost and an estimate forwarded for approval before work is started.

PARTS ORDERING

Standard components and special components used in the Lambda power supply can be obtained from the factory. In case of emergency, critical spare parts are available through any Lambda office.

The following information must be included when ordering parts:

1. Model number and serial number of power supply and purchase date.
2. Lambda part number.
3. Description of part together with circuit designation.
4. If part is not electronic part, or is not listed, provide a description, function, and location, of the part.

PARTS LIST

The electrical parts located on Lambda models LJS-11-5-OV — LJS-11-28-OV are listed here. Parts common to a group of models are listed first. Unique parts of individual models within the group are listed separately, by model, immediately following the group common parts listing.

COMMON PARTS

MODELS LJS-11-5-OV — LJS-11-28-OV

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
A1	Integrated circuit	FBT-00-104
A2	Integrated circuit	FBT-00-105
A3	Integrated circuit	FBT-00-111
A4	Integrated circuit	FBT-00-112
A5	Integrated circuit	FBT-00-113
A6	Optical coupler	FBT-00-107
C1, C2	Cap., metallized polyester film, 0.01 mf ±20%, 630 vdc	CGL-10-020
C3	Cap., elect., 100 mf -10+50%, 63 vdc	CBR-10-139
C4	Not assigned	
C5	Cap., polyester film, 2,200 pf ±10%, 100 vdc	CGK-22-011
C6	Cap., elect., 10 mf -10+50%, 50 vdc	CBR-10-097
C7, C8	Cap., polyester film, 3,300 mf ±10%, 100 vdc	CGK-33-012
C9 thru C12	Cap., ceramic, 270 pf ±10%, 500 vdc	CDJ-27-011
C13	Cap., polyester film, 0.01 mf ±10%, 100 vdc	CGL-10-021
C14, C15	Cap., elect., 100 mf -10+50%, 10 vdc	CBR-10-172
C16, C17	Cap., ceramic, 0.1 mf -20+80%, 50 vdc	CDM-10-004
C18, C19	Not assigned	
C20	Cap., elect., 47 mf -10+50%, 10 vdc	CBP-47-109
C21	Cap., polyester film, 0.022 mf ±10%, 100 vdc	CGL-22-027
C22	Cap., ceramic, 10 pf ±20%, 50 vdc	CDH-10-005
C23	Same as C13	
C24, C25	Not assigned	
C26	Same as C20	
C27	Not assigned	
C28	Same as C20	
C29	Cap., metallized polyester film, 0.47 mf ±20%, 100 vdc	CAM-47-027
C30	Not assigned	
C31	Same as C13	
C32	Cap., polyester film, 4,700 pf ±10%, 100 vdc	CGK-47-015
C33	Not assigned	
C34	Cap., elect., 4.7 mf -10+75%, 35 vdc	CBN-47-053
C35	Same as C16	
C36	Same as C20	
C101, C102	Cap., ceramic, 4,700 pf -20+80%, 2,000 vdc	CDK-47-016
C103	Cap., elect., 220 mf -10+50%, 200 vdc	CBR-22-171
C105 thru C107	Cap., metallized polyester film, 0.1 mf ±20%, 250 vdc	CGM-10-025
C108, C109	Same as C1	

COMMON PARTS (Cont.)

MODELS LJS-11-5-OV — LJS-11-28-OV (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C201, C202	Cap., elect., 330 mf -10+50%, 200 vdc	CBR-33-176
C203	Cap., ceramic, 680 pf ±10%, 2,000 vdc	CDJ-68-012
CR1	Rectifier	FBL-00-162
CR2 thru CR5	Rectifier	FBL-00-164
CR6, CR7	Rectifier, zener diode	FBM-Z169
CR8	Not assigned	
CR9 thru CR16	Rectifier	FBL-00-127
CR17 thru CR20	Same as CR2	
CR21 thru CR28	Rectifier	FBN-00-165
CR29, CR30	Not assigned	
CR31, CR32	Same as CR21	
CR33	Rectifier, zener diode	FBM-Z170
CR34, CR35	Same as CR21	
CR36	Same as CR33	
CR37 thru CR43	Same as CR21	
CR44	Same as CR2	
CR101	Rectifier	FBL-00-133
CT201	Current transformer	BBA-JS12V-1
F1	Fuse, 5A, 3AG, 125V	FFC-05-000
L1, L2	Choke	BBA-JS-10V-2
L3	Choke	BBA-JS-10A-2
L202	Choke	BBA-JS-12V-3
Q1	Transistor, NPN	FBN-L185
Q2, Q3	Transistor, NPN	FBN-L208
Q4 thru Q7	Transistor, NPN	FBN-L206
Q8	Transistor, PNP	FBN-L207
Q9, Q10	Same as Q4	
Q11, Q12	Same as Q2	
Q101	Transistor, NPN	FBN-L183
Q102, Q103	Transistor, NPN	FBN-L191
R1, R2	Res., ww, 0.22 ohm ±5%, 4 w	DEM-22-007
R3	Res., metal oxide, 43,000 ohms ±5%, 2 w	DCT-43-092
R4	Res., metal oxide, 680 ohms ±10%, 8 w	DCR-68-109
R5	Res., carbon film, 5.1 ohms ±5%, ½ w	DBN-51-001
R6	Not assigned	
R7	Res., carbon film, 3,900 ohms ±5%, ¼ w	DBP-39-001
R8	Not assigned	
R9	Res., carbon film, 5,600 ohms ±5%, ¼ w	DBS-56-002

COMMON PARTS (Cont.)

MODELS LJS-11-5-OV — LJS-11-28-OV (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R10	Res., carbon film, 7,500 ohms ±5%, ¼ w	DBS-75-003
R11, R12	Not assigned	
R13 thru R16	Res., carbon film, 12,000 ohms ±5%, ¼ w	DBT-12-001
R17, R18	Res., carbon film, 5,100 ohms ±5%, ¼ w	DBS-51-004
R19, R20	Res., carbon film, 15,000 ohms ±5%, ¼ w	DBT-15-002
R21, R22	Res., carbon film, 27,000 ohms ±5%, ¼ w	DBT-27-003
R23	Res., carbon film, 51 ohms ±5%, ¼ w	DBD-51-003
R24, R25	Res., carbon film, 220 ohms ±5%, ¼ w	DBR-22-002
R26	Res., carbon film, 470 ohms ±5%, ¼ w	DBR-47-003
R27	Not assigned	
R28	Same as R17	
R29	Res., carbon film, 910 ohms ±5%, ¼ w	DBR-91-004
R30	Same as R26	
R31	Res., carbon film, 620 ohms ±5%, ¼ w	DBR-62-005
R32	Res., carbon film, 100 ohms ±5%, ¼ w	DBR-10-006
R33	Res., carbon film, 100 ohms ±5%, ½ w	DBR-10-001
R34	Res., carbon film, 390 ohms ±5%, ¼ w	DBR-39-007
R35	Res., carbon film, 2,000 ohms ±5%, ¼ w	DBS-20-005
R36	Res., carbon film, 200 ohms ±5%, ¼ w	DBR-20-008
R37	Res., carbon film, 300 ohms ±5%, ¼ w	DBR-30-009
R38, R39	Same as R26	
R40, R41	Res., carbon film, 820 ohms ±5%, ¼ w	DBR-82-010
R42 thru R44	Not assigned	
R45, R46	Res., ww, 5.1 ohms ± %, 1 w	DCN-51-001
R47, R48	Res., carbon film, 51 ohms ±5%, ½ w	DBP-51-001
R50	Res., carbon film, 10 ohms ±5%, ¼ w	DBP-10-002
R51	Thermistor, 300 ohms ±15%, 25°C	DKR-30-005
R52	Not assigned	
R56	Res., carbon film, 3,000 ohms ±5%, ¼ w	DBS-30-015
R57	Res., carbon film, 36,000 ohms ±5%, ¼ w	DBT-36-018
R58	Same as R26	
R59	Same as R51	
R60	Same as R24	
R61	Same as R7	
R62, R63	Same as R23	
R64	Res., carbon film, 1,000 ohms ±5%, ¼ w	DBS-10-008
R65	Res., carbon film, 39 ohms ±5%, ¼ w	DBP-39-008
R66	Same as R34	

COMMON PARTS (Cont.)

MODELS LJS-11-5-OV — LJS-11-28-OV (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R67	Res., carbon film, 1,500 ohms ±5%, ¼ w	DBS-15-007
R68, R69	Same as R32	
R70	Same as R35	
R71	Same as R36	
R72	Same as R65	
R73	Res., carbon film, 240 ohms ±5%, ¼ w	DBR-24-011
R74	Res., carbon film, 150 ohms ±5%, ¼ w	DBR-15-012
R75, R76	Same as R26	
R77	Res., carbon film, 6,800 ohms ±5%, ¼ w	DBS-68-017
R78	Same as R35	
R79	Res., carbon film, 2,200 ohms ±5%, ¼ w	DBN-22-004
R201	Same as R1	
R202, R203	Res., metal oxide, 3,000 ohms ±5%, 2 w	DFS-30-098
R205 R206	Res., ww, 51 ohms ±5%, 1.1 w	DFP-51-073
SCR1	Rectifier, silicon, controlled	FBP-00-053
T1	Transformer	ABA-JS12V-1
T2	Transformer	ABA-JS10A-3
VR1	Res., var., cermet, 5,000 ohms ±20%, ¾ w	DRS-50-028
VR2, VR3	Res., var., cermet, 100 ohms ±20%, ½ w	DRR-10-015

UNIQUE PARTS

MODEL LJS-11-5-OV

C104	Cap., elect., 470 mf -10+50%, 10 vdc	CBR-47-177
C204, C205, C206	Cap., polyester film, 4,700 pf ±10%, 100 vdc	CGK-47-015
C207	Cap., elect., 6,800 mf -10+50%, 10 vdc	CBS-68-179
C208, C209	Cap., elect., 2,200 mf -10+50%, 10 vdc	CBS-22-138
CR102, CR103	Rectifier	FBL-00-133
L201	Choke	BBA-LJS11A-5
L203	Choke	BBA-JS12V-3
MC101	Protector, overvoltage	L-35-OV-5
R49	Res., carbon film, 200 ohms ±5%, ¼ w	DBR-20-008
R53	Res., carbon film, 3,300 ohms ±5%, ¼ w	DBS-33-009
R54	Res., carbon film, 1,600 ohms ±5%, ¼ w	DBS-16-016
R55	Res., carbon film, 910 ohms ±5%, ¼ w	DBR-91-004
R204	Res., ww, 51 ohms ±5%, 1.1 w	DFP-51-073
R207	Res., metal oxide, 51 ohms ±5%, 2 w	DFP-51-072
SH201, SH202	Shunt	ESP-30-018
T201	Transformer	ABA-LJS11A-5

UNIQUE PARTS (Cont.)

MODEL LJS-11-6-OV

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C104	Cap., elect., 470 mf -10+50%, 10 vdc	CBR-47-177
C204, C205, C206	Cap., polyester film, 4,700 pf ±10%, 100 vdc	CGK-47-015
C207	Cap., elect., 6,800 mf -10+50%, 10 vdc	CBS-68-179
C208, C209	Cap., elect., 2,200 mf -10+50%, 10 vdc	CBS-22-138
CR102, CR103	Rectifier	FBL-00-133
L201	Choke	BBA-LJS11A-5
L203	Choke	BBA-JS12V-3
MC101	Protector, overvoltage	L-35-OV-6
R49	Res., carbon film, 200 ohms ±5%, ¼ w	DBR-20-008
R53	Res., carbon film, 4,300 ohms ±5%, ¼ w	DBS-43-010
R54	Res., carbon film, 5,100 ohms ±5%, ¼ w	DBS-51-004
R55	Res., carbon film, 1,100 ohms ±5%, ¼ w	DBS-11-012
R204	Res., ww, 51 ohms ±5%, 1.1 w	DFP-51-073
R207	Res., metal oxide, 51 ohms ±5%, 2 w	DFP-51-072
SH201, SH202	Shunt	ESP-30-018
T201	Transformer	ABA-LJS11A-6

MODEL LJS-11-12-OV

C104	Cap., elect., 220 mf -10+50%, 25 vdc	CBR-22-178
C204, C205, C206	Cap., ceramic, 4,700 pf ±10%, 500 vdc	CDK-47-018
C207	Cap., elect., 3,300 mf -10+50%, 25 vdc	CBS-33-180
C208, C209	Cap., elect., 470 mf -10+50%, 25 vdc	CBR-47-140
CR102, CR103	Rectifier	FBL-00-131
L201	Choke	BBA-LJS11A-12
L203	Choke	BBA-JS12V-3
MC101	Protector, overvoltage	L-35-OV-12
R49	Res., carbon film, 100 ohms ±5%, ¼ w	DBR-10-006
R53	Res., carbon film, 9,100 ohms ±5%, ¼ w	DBS-91-011
R54	Res., carbon film, 7,500 ohms ±5%, ¼ w	DBS-75-003
R55	Res., carbon film, 1,300 ohms ±5%, ¼ w	DBS-13-013
R204	Res., ww, 51 ohms ±5%, 1.1 w	DFP-51-073
R207	Res., metal oxide, 300 ohms ±5%, 2 w	DFR-30-126
SH201	Shunt	ESP-30-018
T201	Transformer	ABA-LJS11A-12

UNIQUE PARTS (Cont.)

MODEL LJS-11-15-OV

CIRC. DESIG.	DESCRIPTION	LAMBDA NO
C104	Cap., elect., 220 mf -10+50%, 25 vdc	CBR-22-178
C204, C205, C206	Cap., ceramic, 4,700 pf ±10%, 500 vdc	CDK-47-018
C207	Cap., elect., 3,300 mf -10+50%, 25 vdc	CBS-33-180
C208, C209	Cap., elect., 470 mf -10+50%, 25 vdc	CBR-47-140
CR102, CR103	Rectifier	FBL-00-131
L201	Choke	BBA-LJS11A-15
MC101	Protector, overvoltage	L-20-OV-15
R49	Res., carbon film, 100 ohms ±5%, ¼ w	DBR-10-006
R53, R54	Res., carbon film, 12,000 ohms ±5%, ¼ w	DBT-12-001
R55	Res., carbon film, 1,300 ohms ±5%, ¼ w	DBS-13-013
R204	Res., ww, 51 ohms ±5%, 1.1 w	DFP-51-073
R207	Res., metal oxide, 360 ohms ±5%, 2 w	DFR-36-127
T201	Transformer	ABA-LJS11A-15

MODEL LJS-11-20-OV

C104	Cap., elect., 100 mf -10+50%, 35 vdc	CBR-10-144
C204, C205, C206	Cap., ceramic, 4,700 pf ±10%, 500 vdc	CDK-47-018
C207	Cap., elect., 2,200 mf -10+50%, 35 vdc	CBS-22-145
C208, C209	Cap., elect., 470 mf -10+50%, 35 vdc	CBR-47-141
CR102, CR103	Rectifier	FBL-00-132
L201	Choke	BBA-LJS11A-15
MC101	Protector, overvoltage	L-20-OV-20
R49	Res., carbon film, 100 ohms ±5%, ¼ w	DBR-10-006
R53	Res., carbon film, 16,000 ohms ±5%, ¼ w	DBT-16-004
R54	Res., carbon film, 27,000 ohms ±5%, ¼ w	DBT-27-003
R55	Res., carbon film, 1,800 ohms ±5%, ¼ w	DBS-18-014
R204A, R204B	Res., ww, 100 ohms ±5%, 1.1 w	DFR-10-130
R207	Res., metal oxide, 620 ohms ±5%, 2 w	DFR-62-128
T201	Transformer	ABA-LJS11A-20

UNIQUE PARTS (Cont.)

MODEL LJS-11-24-OV

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C104	Cap., elect., 100 mf -10+50%, 35 vdc	CBR-10-144
C204, C205, C206	Cap., ceramic, 4,700 pf ±10%, 500 vdc	CDK-47-018
C207	Cap., elect., 2,200 mf -10+50%, 35 vdc	CBS-22-145
C208, C209	Cap., elect., 470 mf -10+50%, 35 vdc	CBR-47-141
CR102, CR103	Rectifier	FBL-00-132
L201	Choke	BBA-LJS11A-15
MC101	Protector, overvoltage	L-20-OV-24
R49	Res., carbon film, 100 ohms ±5%, ¼ w	DBR-10-006
R53	Res., carbon film, 20,000 ohms ±5%, ¼ w	DBT-20-005
R54	Res., carbon film, 43,000 ohms ±5%, ¼ w	DBT-43-007
R55	Res., carbon film, 1,300 ohms ±5%, ¼ w	DBS-13-013
R204A, R204B	Res., ww, 100 ohms ±5%, 1.1 w	DFR-10-130
R207	Res., metal oxide, 910 ohms ±5%, 2 w	DFR-91-129
T201	Transformer	ABA-LJS11A-24

UNIQUE PARTS (Cont.)

MODEL LJS-11-28-OV

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C104	Cap., elect., 100 mf -10+50%, 63 vdc	CBR-10-139
C204, C205, C206	Cap., ceramic, 4,700 pf ±10%, 500 vdc	
C207	Cap., elect., 1,000 mf -10+50%, 63 vdc	CBS-22-145
C208, C209	Cap., elect., 330 mf -10+50%, 50 vdc	CBR-33-142
CR102, CR103	Rectifier	FBL-00-132
L201	Choke	BBA-LJS11A-15
MC101	Protector, overvoltage	L-20-OV-28
R49	Res., carbon film, 100 ohms ±5%, ¼ w	DBR-10-006
R53	Res., carbon film, 24,000 ohms ±5%, ¼ w	DBT-24-006
R54	Res., carbon film, 91,000 ohms ±5%, ¼ w	DBT-91-008
R55	Res., carbon film, 2,400 ohms ±5%, ¼ w	DBS-24-027
R204A, R204B	Res., ww, 100 ohms ±5%, 1.1 w	DFR-10-130
R207	Res., metal oxide, 1,200 ohms ±5%, 2 w	DFS-12-097
T201	Transformer	ABA-LJS11A-28

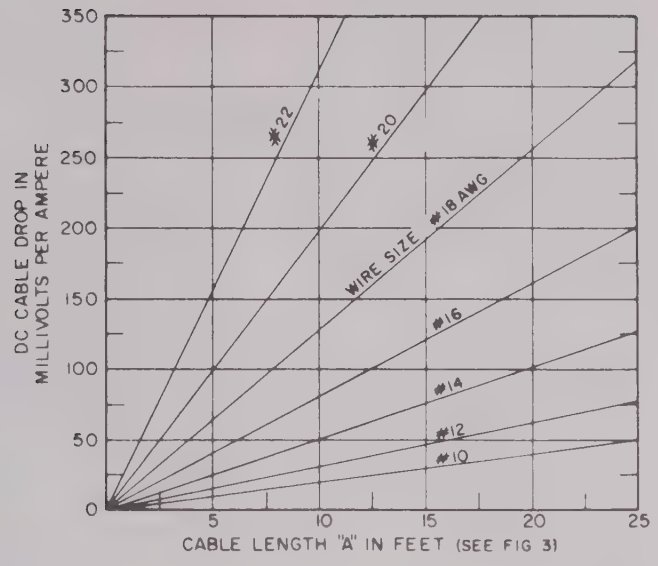


Figure 1. Cable Connection Chart.

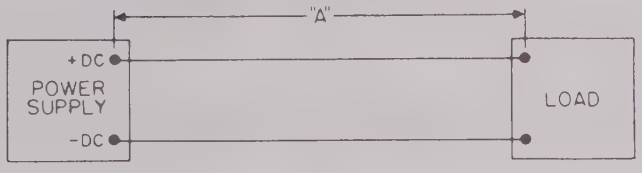


Figure 2. Cable Length "A" in Feet.

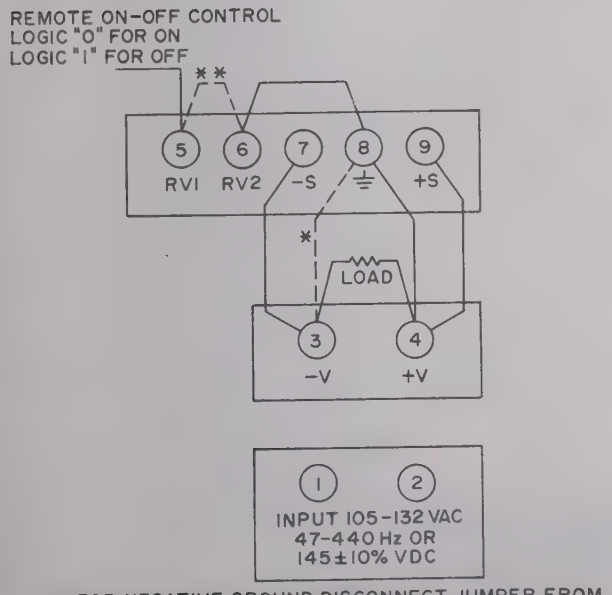


Figure 3. Local Sensing Connections.

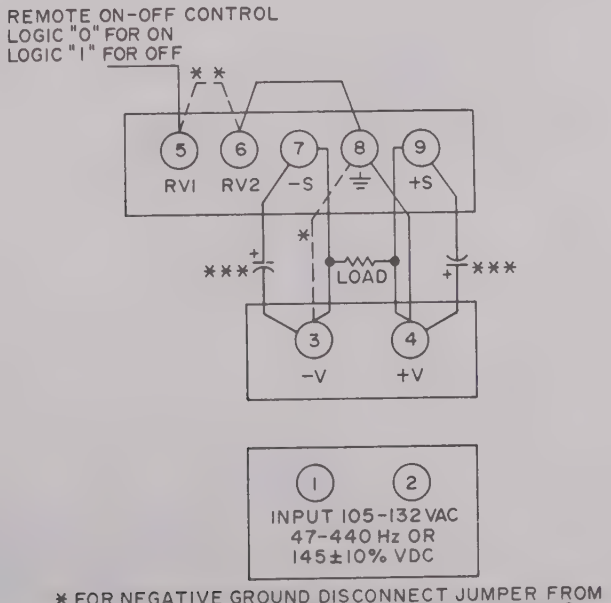


Figure 4. Remote Sensing Connections.

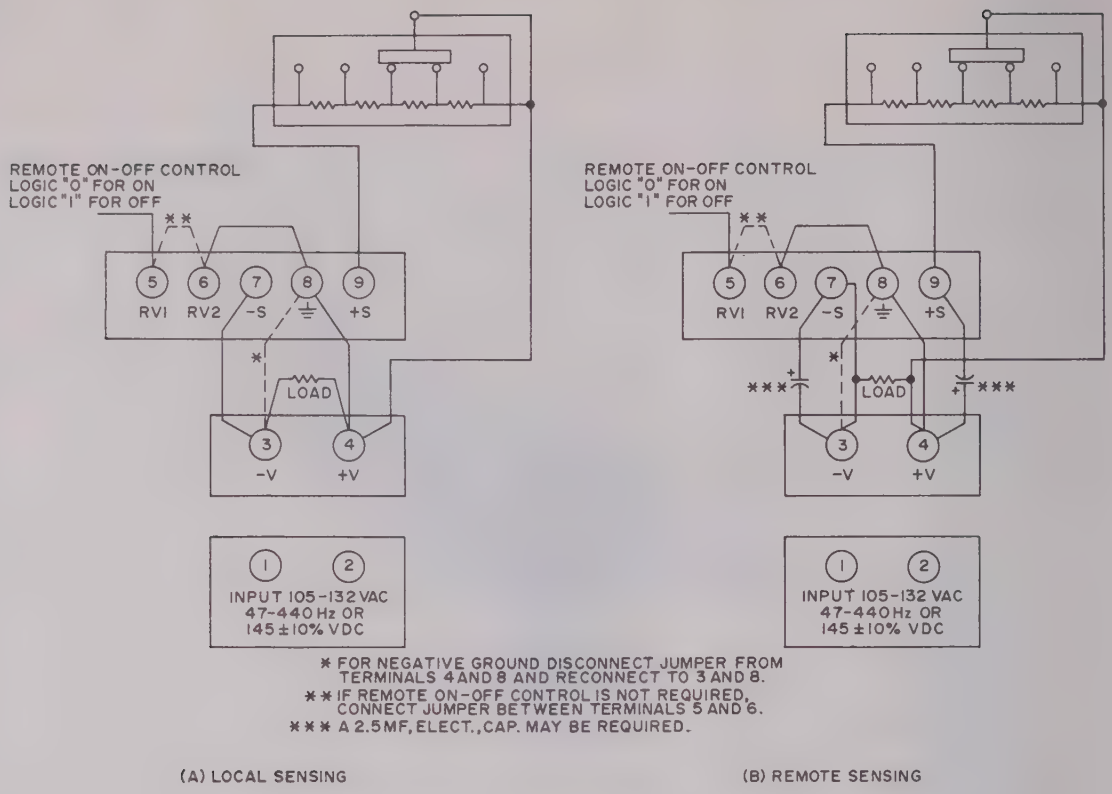


Figure 5. Programmed Voltage, With External Resistor.

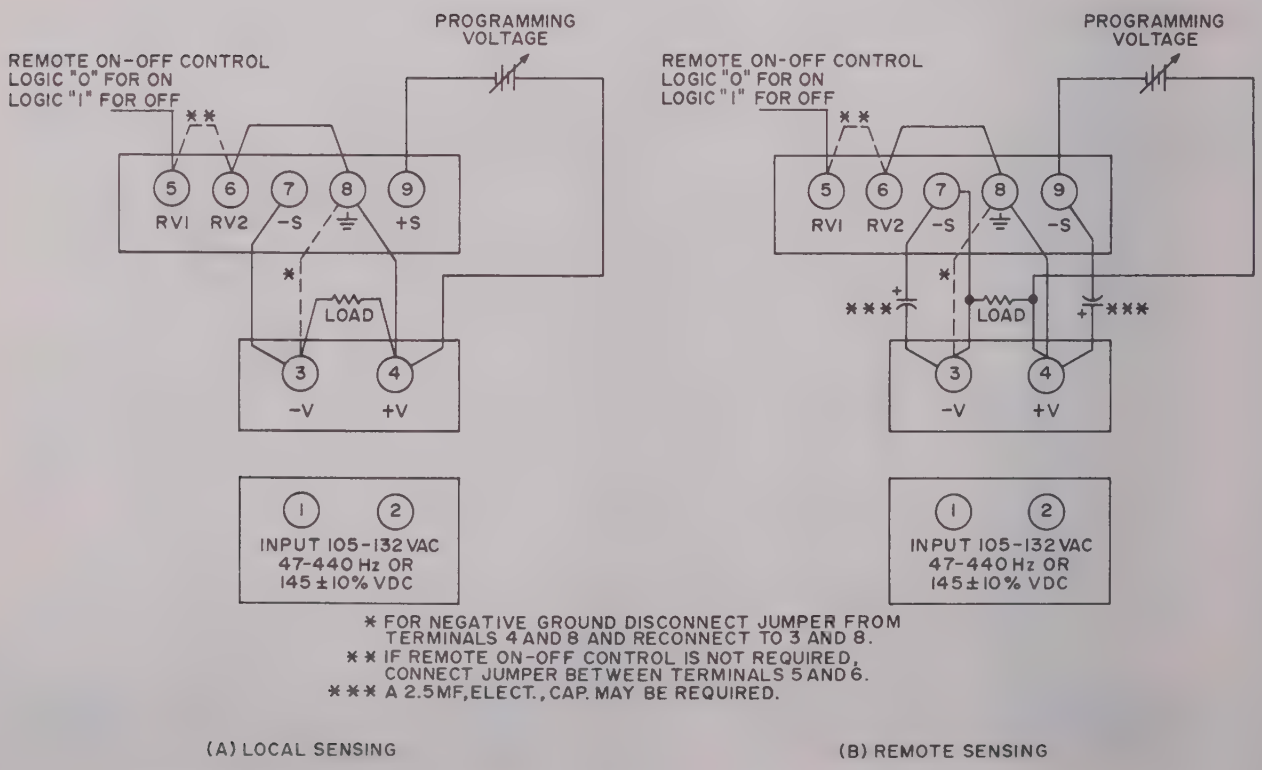
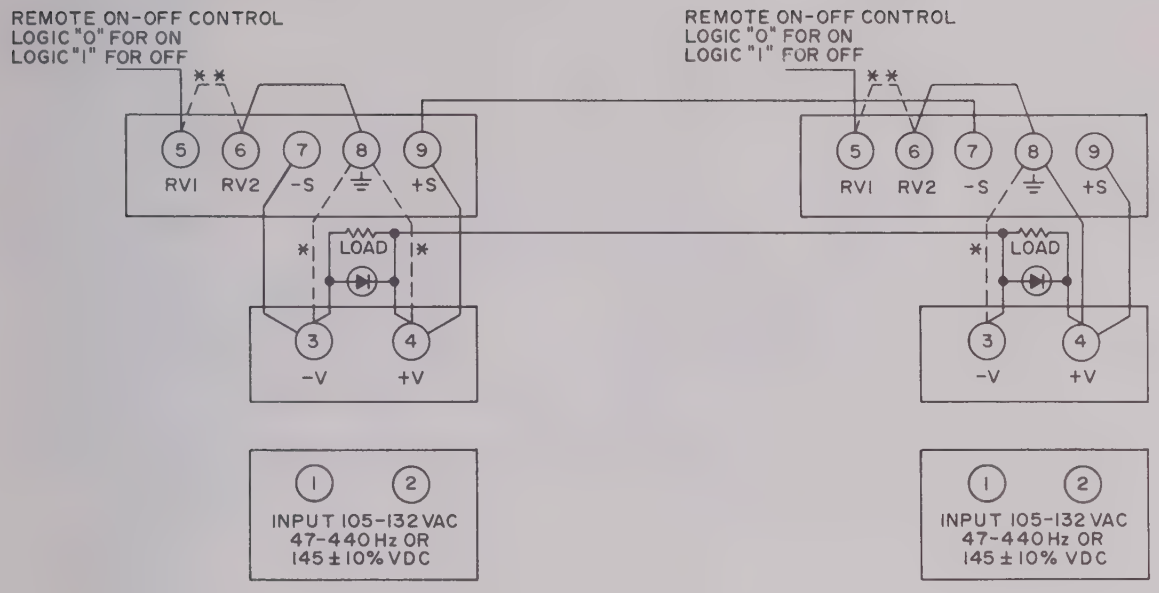
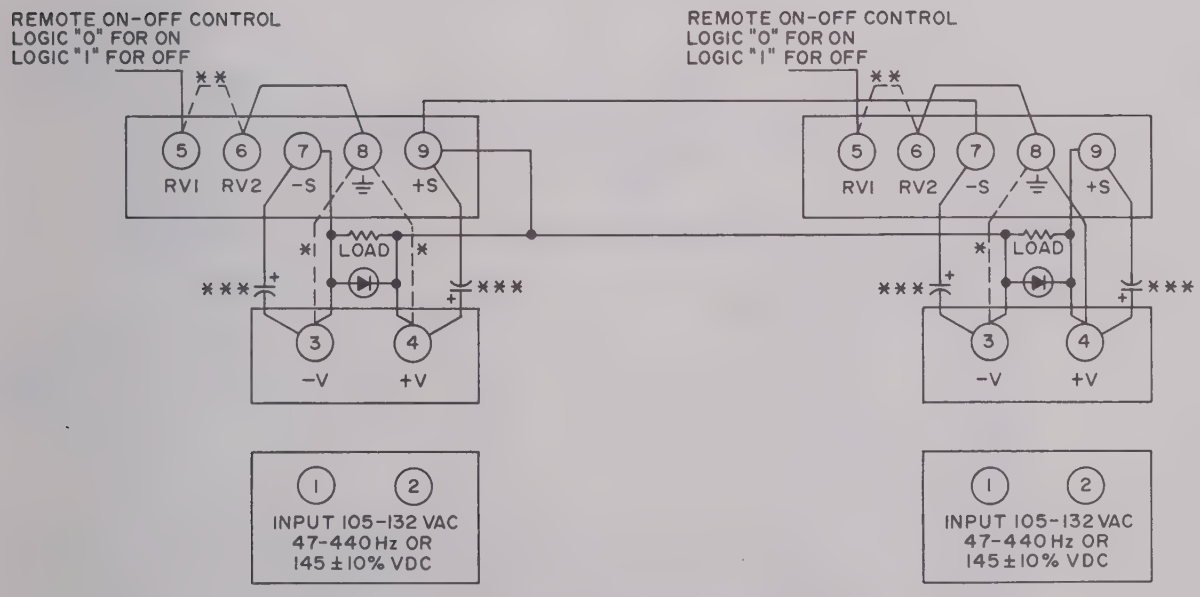


Figure 6. Programmed Voltage, with External Programming Voltage Source.



(A) LOCAL SENSING



(B) REMOTE SENSING

* MAKE ONLY ONE GROUND CONNECTION FOR SERIES COMBINATION. TO CHANGE GROUND AS SHOWN, REMOVE JUMPER FROM TERMINALS 4 AND 8 ON RIGHT HAND UNIT AND CONNECT ANY ONE OF THE OTHER JUMPERS AS SHOWN IN DOTTED LINE.

** IF REMOTE ON-OFF CONTROL IS NOT REQUIRED, CONNECT JUMPER BETWEEN TERMINALS 5 AND 6.

*** A 2.5 MF, ELECT., CAP. MAY BE REQUIRED.

Figure 7. Series Connections.

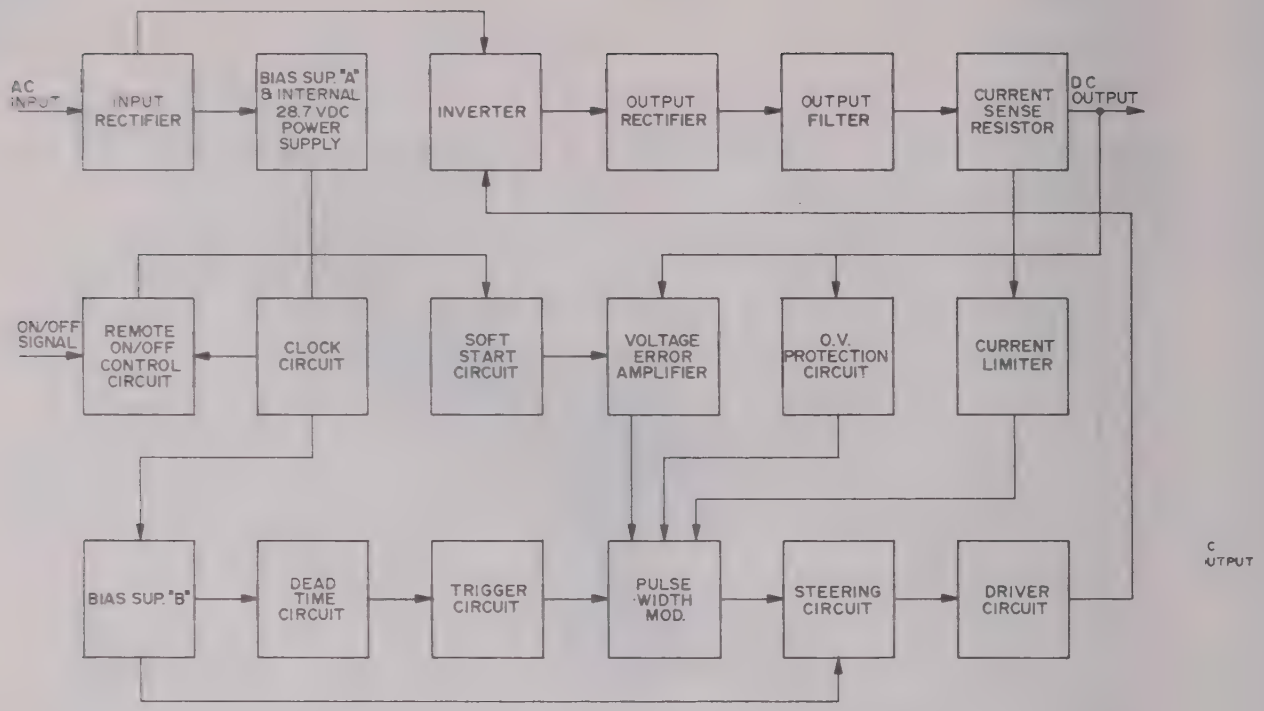


Figure 8. Typical Block Diagram.

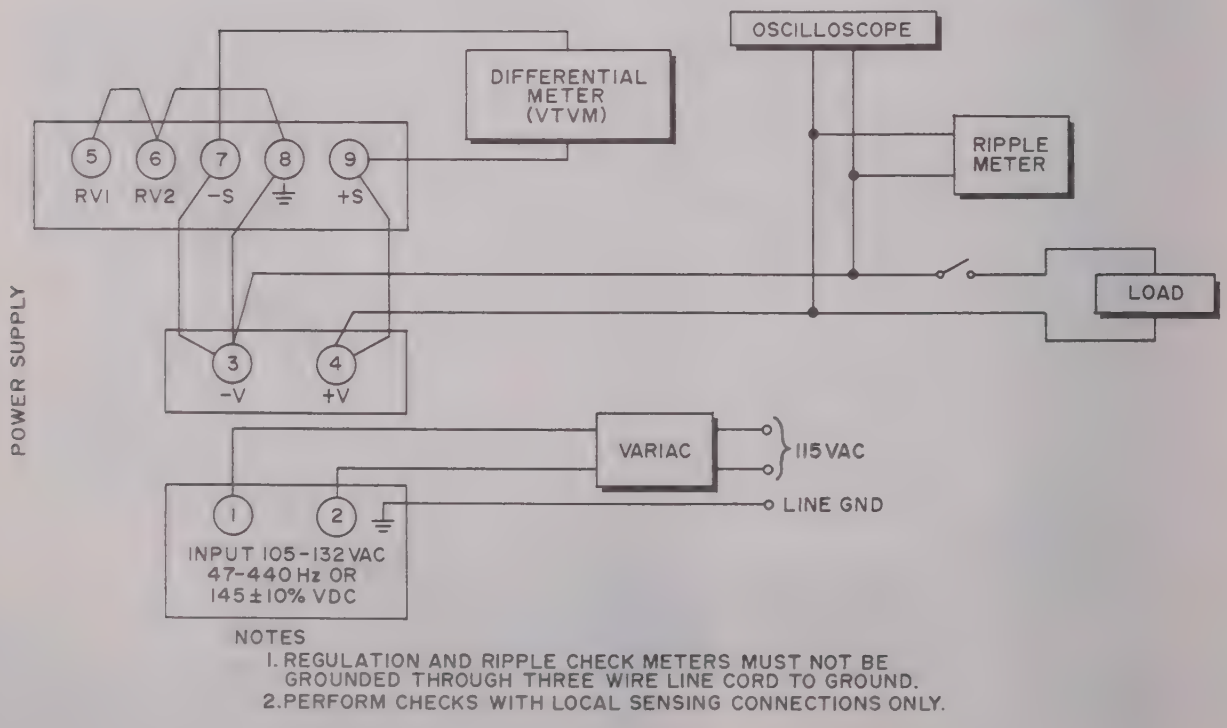


Figure 9. Test Connections for Performance Checks.

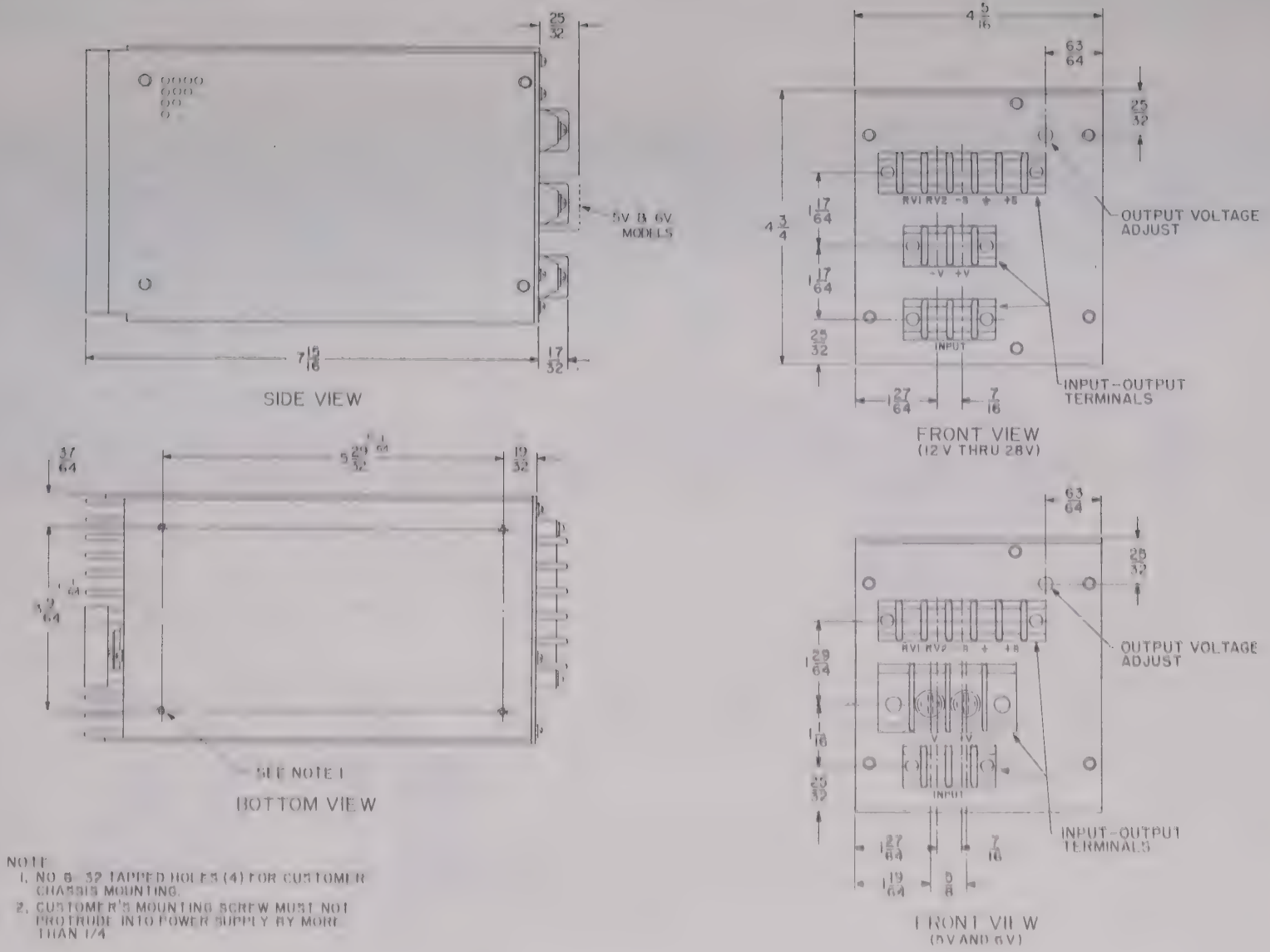
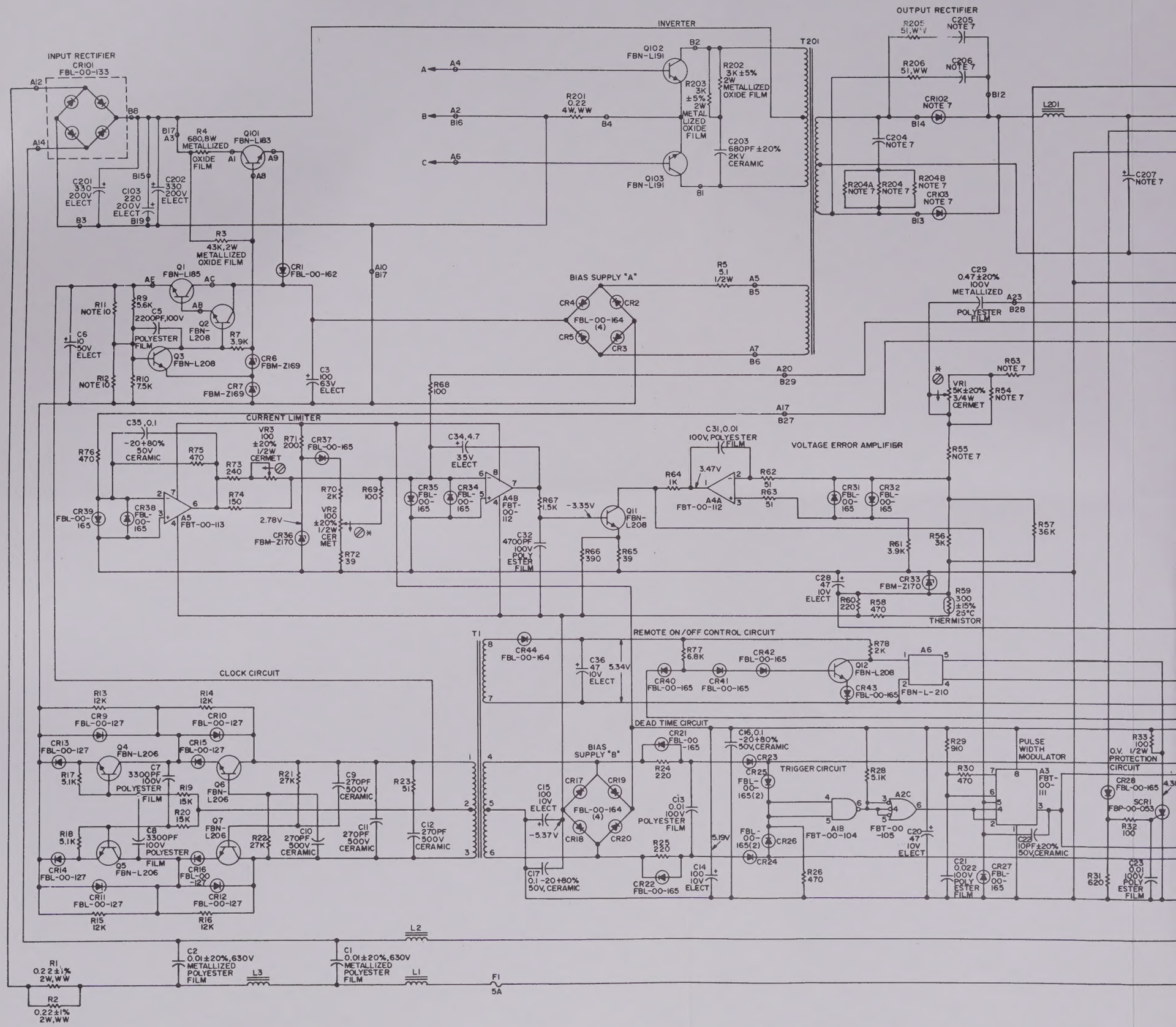

SIDE VIEW
5V & 6V MODELS
FRONT VIEW
(12 V THRU 28V)
OUTPUT VOLTAGE ADJUST
INPUT-OUTPUT TERMINALS
BOTTOM VIEW
SEE NOTE 1
FRONT VIEW
(5V AND 6V)
NOTE
1. NO 6-32 TAPPED HOLES (4) FOR CUSTOMER CHASSIS MOUNTING.
2. CUSTOMER'S MOUNTING SCREW MUST NOT PROTRUDE INTO POWER SUPPLY BY MORE THAN 1/4

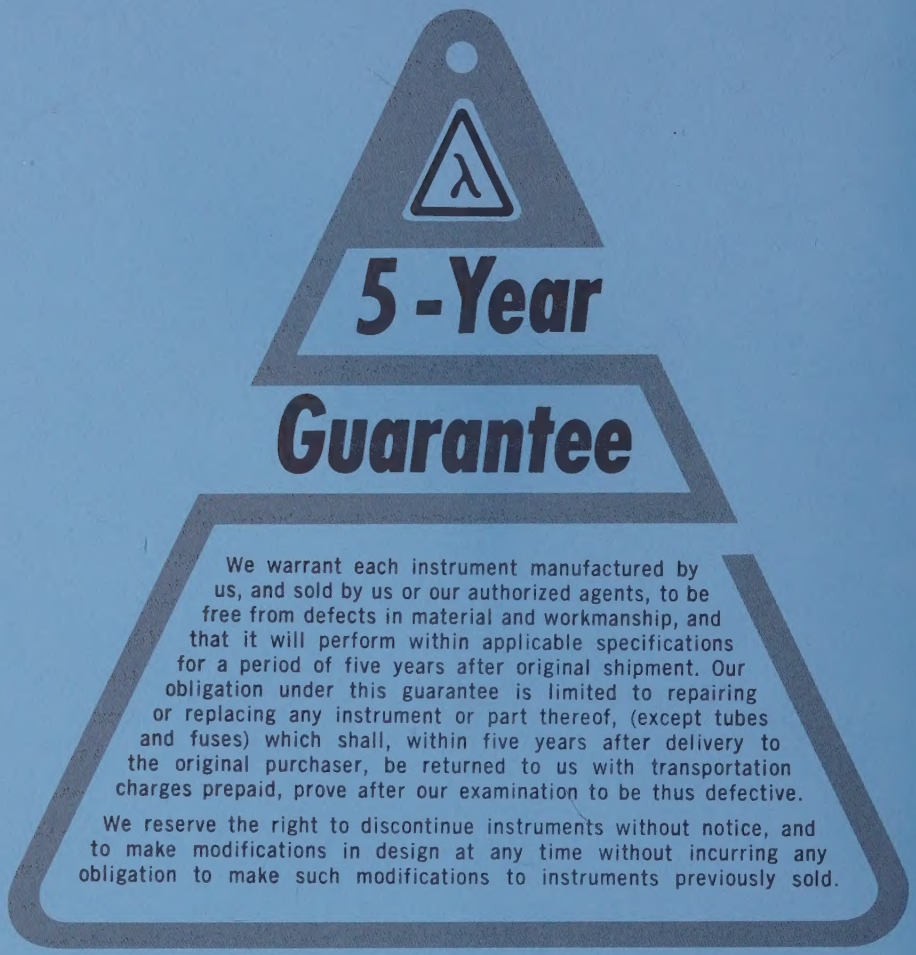
Figure 10. Outline Drawing.

TABLE I
SCHEMATIC DATA REFERENCES
MODELS LJS-11-5-OV THROUGH LJS-11-28-OV

Model	SCHEMATIC COMPONENTS													
	C104	C204 C205 C206	C207	C208 C209	CR102 CR103	R49	R53	R54	R55	R204	R204A R204B	R207	SH201 (1) SH202 (2)	MC101
	-10+50% ELECT.	±10% CERAMIC	-10+50% ELECT.	-10+50% ELECT.	FBL-00*	CARBON FILM ±5%, ¼W	CARBON FILM ±5%, ¼W	CARBON FILM ±5%, ¼W	CARBON FILM ±5%, ¼W	WW ±5% 1W	WW ±5%, 1W	METAL OXIDE ±5%, 2W	SHUNT ESP-30- 018	O.V. PROT.
LJS-11-5-OV	470 mf 10 vdc	4700 pf 100 vdc POLY- FILM	6800 mf 10 vdc	2200 mf 10 vdc	169	200	3.3K	1.6K	910	51	NOT USED	51	(1) and (2)	*L-35-OV-5
LJS-11-6-OV	470 mf 10 vdc	4700 pf 100 vdc POLY- FILM	6800 mf 10 vdc	2200 mf 10 vdc	169	200	4.3K	5.1K	1.1K	51	NOT USED	51	(1) and (2)	*L-35-OV-6
LJS-11-12-OV	220 mf 25 vdc	4700 pf 500 vdc	330 mf 25 vdc	470 mf 25 vdc	131	100	9.1K	7.5K	1.3K	51	NOT USED	300	(1) ONLY	*L-35-OV-12
LJS-11-15-OV	220 mf 25 vdc	4700 pf 500 vdc	3300 mf 25 vdc	470 mf 25 vdc	131	100	12K	12K	1.3K	51	NOT USED	360	NONE USED	*L20-OV-15
LJS-11-20-OV	100 mf 35 vdc	4700 pf 500 vdc	2200 mf 35 vdc	470 mf 35 vdc	132	100	16K	27K	1.8K	NOT USED	100	620	NONE USED	*L20-OV-20
LJS-11-24-OV	100 mf 35 vdc	4700 pf 500 vdc	2200 mf 35 vdc	470 mf 35 vdc	132	100	20K	43K	1.8K	NOT USED	100	910	NONE USED	*L20-OV-24
LJS-11-28-OV	100 mf 63 vdc	4700 pf 500 vdc	1000 mf 63 vdc	330 mf 50 vdc	132	100	24K	91K	2.4K	NOT USED	100	1200	NONE USED	*L20-OV-28

*Lambda part number


INPUT RECTIFIER
CR101
FBL-00-133
INVERTER
OUTPUT RECTIFIER
Q102
FBN-L191
Q103
FBN-L191
T201
R201
0.22
4W,WW
R202
3K ±5%
2W
METALLIZED
OXIDE FILM
R203
3K
±5%
2W
METALLIZED
OXIDE FILM
C203
680PF ±20%
2KV
CERAMIC
R205
51,WW
R206
51,WW
C205
NOTE 7
C206
NOTE 7
CR102
NOTE 7
C204
NOTE 7
R204A
NOTE 7
R204
NOTE 7
R204B
NOTE 7
CR103
NOTE 7
L201
C207
NOTE 7
R4
680,8W
METALLIZED
OXIDE
FILM
Q101
FBN-L183
C201
330
200V
ELECT
C103
220
200V
ELECT
C202
330
200V
ELECT
R3
43K,2W
METALLIZED
OXIDE FILM
CR1
FBL-00-162
Q1
FBN-L185
Q2
FBN-
L208
Q3
FBN-L208
R5
5.1
1/2W
BIAS SUPPLY "A"
CR4
CR2
FBL-00-164
(4)
CR5
CR3
C29
0.47 ±20%
100V
METALLIZED
POLYESTER
FILM
R9
5.6K
C5
2200PF,100V
POLYESTER
FILM
R7
3.9K
R11
NOTE 10
C6
10
50V
ELECT
R12
NOTE 10
R10
7.5K
CR6
FBM-Z169
CR7
FBM-Z169
C3
100
63V
ELECT
R68
100
VR1
5K ±20%
3/4W
CERMET
R54
NOTE 7
R53
NOTE 7
CURRENT LIMITER
C35,0.1
-20+80%
50V
CERAMIC
R76
470
R75
470
VR3
100
±20%
1/2W
CERMET
R71
200
CR37
FBL-00-165
R73
240
R74
150
CR39
FBL-00-165
CR38
FBL-00-165
A5
FBT-00-113
R70
2K
VR2
100
±20%
1/2W
CERMET
2.78V
CR36
FBM-Z170
R72
39
R69
100
C34,4.7
35V
ELECT
CR35
FBL-00-165
CR34
FBL-00-165
A4B
FBT-00-112
R67
1.5K
-3.35V
Q11
FBN-L208
C32
4700PF
100V
POLY
ESTER
FILM
R66
390
R65
39
VOLTAGE ERROR AMPLIFIER
C31,0.01
100V, POLYESTER
FILM
3.47V
R64
1K
A4A
FBT-00-112
R62
51
R63
51
CR31
FBL-00-165
CR32
FBL-00-165
R55
NOTE 7
R57
36K
R61
3.9K
R56
3K
C28
47
10V
ELECT
CR33
FBM-Z170
R60
220
R58
470
R59
300
±15%
25°C
THERMISTOR
REMOTE ON/OFF CONTROL CIRCUIT
T1
CR44
FBL-00-164
C36
47
10V
ELECT
5.34V
R77
6.8K
CR40
FBL-00-165
CR41
FBL-00-165
CR42
FBL-00-165
R78
2K
Q12
FBN-L208
CR43
FBL-00-165
A6
FBN-L-210
CLOCK CIRCUIT
R13
12K
R14
12K
CR9
FBL-00-127
CR10
FBL-00-127
CR13
FBL-00-127
CR15
FBL-00-127
Q4
FBN-L206
Q6
FBN-
L206
Q7
FBN-
L206
Q5
FBN-L206
R17
5.1K
C7
3300PF
100V
POLYESTER
FILM
R19
15K
R20
15K
R18
5.1K
C8
3300PF
100V
POLYESTER
FILM
R21
27K
C9
270PF
500V
CERAMIC
C10
270PF
500V
CERAMIC
C11
270PF
500V
CERAMIC
R23
51
C12
270PF
500V
CERAMIC
R22
27K
CR14
FBL-00-127
CR16
FBL-00-127
CR11
FBL-00-127
CR12
FBL-00-127
R15
12K
R16
12K
DEAD TIME CIRCUIT
CR21
FBL-00-165
R24
220
BIAS
SUPPLY "B"
CR17
CR19
FBL-00-164
(4)
CR18
CR20
C15
100
10V
ELECT
-5.37V
C13
0.01
100V
POLYESTER
FILM
5.19V
R25
220
CR22
FBL-00-165
C14
100
10V
ELECT
C17
0.1 -20+80%
50V, CERAMIC
C16,0.1
-20+80%
50V,CERAMIC
CR23
CR25
FBL-00-165(2)
CR26
FBL-00-165(2)
CR24
TRIGGER CIRCUIT
R28
5.1K
A2C
A1B
FBT-00-104
FBT-00
-105
C20
47
10V
ELECT
R26
470
R29
910
R30
470
PULSE
WIDTH
MODULATOR
A3
FBT-
00-
111
C22
10PF ±20%
50V,CERAMIC
C21
0.022
100V
POLY
ESTER
FILM
CR27
FBL-
00-
165
R33
100
O.V. 1/2W
PROTECTION
CIRCUIT
CR28
FBL-00-165
SCR1
FBP-00-053
R32
100
R31
620
C23
0.01
100V
POLY
ESTER
FILM
L2
C2
0.01 ±20%,630V
METALLIZED
POLYESTER
FILM
L3
C1
0.01 ±20%,630V
METALLIZED
POLYESTER
FILM
L1
F1
5A
R1
0.22 ±1%
2W,WW
R2
0.22 ±1%
2W,WW


5-Year
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We reserve the right to discontinue instruments without notice, and to make modifications in design at any time without incurring any obligation to make such modifications to instruments previously sold.

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